

Precise Control and Dynamic Tuning of Structural Colors with Bidisperse Colloidal Arrays

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Colloidal crystals and glasses have their own photonic effects. Colloidal crystals show high reflectivity at narrowband, whereas colloidal glasses show low reflectivity at broadband. To compromise the opposite optical properties, we suggest a simple approach for controlling the colloidal arrangement between crystal and glass by employing two different sizes of silica particles with interparticle repulsion. When two different sizes of silica particles coexist, the arrangement of silica particles is significantly influenced by two parameters: size contrast and mixing ratio. When the size contrast is small, a long-range order is partially conserved in the entire mixing ratio, resulting in a sharp reflectance peak and brilliant structural color. When the size contrast is large, the long-range order is rapidly reduced along with mixing ratio. Nevertheless, a short-range order survives, which causes low reflectivity at a broad wavelength, exhibiting faint structural colors. These findings offer an insight into controlling the colloidal arrays and provide a simple way to modulate the optical property for structural coloration.